Q.P.Code: 50057

(3 Hours) **[Total Marks:80]**

N.B. **(1)** Question no.1 is compulsory.
(2) Attempt any three from the remaining.
(3) Make any suitable assumption wherever required.

Q.1 Answer any **four**.

(a) Explain properties of magnetic materials required for electrical machine design. 5M
(b) Explain saving of copper in autotransformer over two winding transformer. 5M
(c) Explain the conditions for parallel operation of three phase transformer. 5M
(d) Explain disadvantages of harmonics in transformer. 5M
(e) Explain Burden of potential transformer 5M

Q.2 **(a)** Draw and explain back to back test. 10M
(b) Two single phase transformers A and B rated at 600KVA and 500KVA resp. are operated in parallel to supply a load of 1000KVA at 0.8 lagging power factor. The resistance and reactance of transformer A are 3% and 6.5% while that of transformer B are 1.5% and 8%. Calculate the KVA loading and the power factor at which each transformer operate. 10M

Q.3 **(a)** Explain excitation phenomenon in three phase transformer. 10M
(b) Calculate the no load current of a 400V, 50 Hz, single phase core type transformer having the following data: 10M
Stacking factor = 0.9, density = 7.8×10^3 kg/m^3, length of mean flux path = 2.2 m, gross iron section = 10×10^{-3}m^2, primary turns = 200, joints equivalent to 0.2 mm air gap. Assume mmf/meter = 210 A/m, Iron loss per kg = 1.3W/kg for the corresponding flux density of 1Wb/mm^2.

Q.4 **(a)** Derive an output equation of a three phase core transformer. 10M
(b) Determine the dimensions of core and yoke for a 200KVA, 50Hz single phase core type transformer. A cruciform core is used with distance between adjacent limbs equal to 1.6 times the width of core laminations. Assume voltage per turn 14V, maximum flux density 1.1Wb/m^2, window space factor 0.32, current density 3A/mm^2 and stacking factor = 0.9. The net iron area is $0.56d^2$ in a cruciform core where d is the diameter of circumscribing circle. Also the width of largest stamping is 0.85d. 10M

Q.5 **(a)** Explain 'Oscillating Neutral'. 10M
(b) A 300 KVA, 6600/400V, 50 Hz, delta/star three phase core type transformer has the following data: Width of hv winding = 25mm, Width of lv winding = 16mm, height of coils =0.5m, length of mean turn =0.9m, hv winding turns=830, width of duct between hv and lv winding =15mm, calculate the leakage reactance of the transformer referred to the hv side. If the lv coil is split in to two parts with one part on each side of the hv coil, calculate leakage reactance referred to hv side. Assume that there is a duct 15mm wide between hv winding and each part of lv winding. 10M

Q.6 **(a)** Draw and explain Scott connection. What are the applications of Scott connection? 10M
(b) Explain various cooling methods in transformer. 10M